

What is claimed is:

1. A process of cleaning a semiconductor manufacturing system having a reaction chamber and a substrate-supporting electrode provided inside the reaction chamber, a substrate being located on the substrate-supporting electrode when forming a semiconductor film on the substrate, the process comprising:

positioning an insulating cover on the substrate-supporting electrode in tight contact with the substrate-supporting electrode; and

supplying a fluoride-based cleaning gas into the reaction chamber and generating a plasma in the reaction chamber.

2. The process of cleaning as set forth in claim 1, wherein the fluoride-based cleaning gas is one of NF_3 , CF_4 , C_3F_8 , C_2F_6 , and ClF_3 .

3. The process of cleaning as set forth in claim 1, wherein the positioning of the insulating cover in tight contact with the substrate-supporting electrode comprises placing the insulating cover on the substrate-supporting electrode, and applying a voltage to the substrate-supporting electrode.

4. A process of cleaning a semiconductor manufacturing system having a reaction chamber and a substrate-supporting electrode provided inside the reaction chamber, with a substrate being placed on the substrate-supporting electrode when forming a semiconductor film on the substrate, the process comprising:

positioning an insulating cover on the substrate-supporting electrode;

supplying a fluoride-based cleaning gas into the reaction

chamber, and supplying at least one of an inert gas and a fluorine-reducing gas into the reaction chamber from an approximate center of the substrate-supporting electrode through a gap between the insulating cover and the substrate-supporting electrode, a pressure in the gap being maintained to be higher than a pressure in the reaction chamber; and

generating a plasma in the reaction chamber.

5. The process of cleaning as set forth in claim 4, wherein the fluoride-based cleaning gas is one of NF_3 , CF_4 , C_3F_8 , C_2F_6 , and ClF_3 .

6. The process of cleaning as set forth in claim 4, wherein the fluorine-reducing gas is H_2 or NH_3 .

7. The process of cleaning as set forth in claim 4, wherein the inert gas is He gas.

8. A process of cleaning a semiconductor manufacturing system having a reaction chamber and a substrate-supporting electrode provided inside the reaction chamber, with a substrate being placed on the substrate-supporting electrode when forming a semiconductor film on the substrate, the process comprising:

positioning an insulating cover on the substrate-supporting electrode;

supplying a fluoride-based cleaning gas into the reaction chamber and then generating a plasma in the reaction chamber;

removing the insulating cover from the substrate-supporting electrode to expose a surface of the substrate-supporting electrode; and

supplying a fluorine-reducing gas into the reaction chamber and generating a plasma.

9. The process of cleaning as set forth in claim 8, wherein the fluoride-based cleaning gas is one of NF_3 , CF_4 , C_3F_8 , C_2F_6 , and ClF_3 .

10. The process of cleaning as set forth in claim 8, wherein the fluorine-reducing gas is H_2 or NH_3 .

11. A process of cleaning a semiconductor manufacturing system having a reaction chamber and a substrate-supporting electrode provided inside the reaction chamber, with a substrate being placed on the substrate-supporting electrode when forming a semiconductor film on the substrate, the process comprising:

positioning an insulating cover on the substrate-supporting electrode;

supplying a fluoride-based cleaning gas into the reaction chamber and generating a plasma in the reaction chamber;

supplying a fluorine-reducing gas into the reaction chamber and then generating a plasma;

removing the insulating cover from the substrate-supporting electrode to expose a surface of the substrate-supporting electrode; and

forming a silicon oxide film containing an excessive amount of silicon on the surface of the substrate-supporting electrode.

12. The process of cleaning as set forth in claim 11, wherein the fluoride-based cleaning gas is one of NF_3 , CF_4 , C_3F_8 , C_2F_6 , and ClF_3 .

13. The process of cleaning as set forth in claim 11, wherein the fluorine-reducing gas is H_2 or NH_3 .

14. A process of cleaning a semiconductor manufacturing system having a reaction chamber and a substrate-supporting electrode provided inside the reaction chamber, with a substrate being placed on the substrate-supporting electrode when forming a semiconductor film on the substrate, the process comprising:

supplying hydrogen gas and an inert gas into the reaction chamber and generating a plasma when the semiconductor manufacturing system is in a standby condition before loading the substrate into the reaction chamber.

15. The process of cleaning as set forth in claim 14, wherein the inert gas is Ar gas or He gas.

16. The process of cleaning as set forth in claim 14, further comprising generating a plasma with the substrate-supporting electrode immediately before loading the substrate into the reaction chamber.

17. The process of cleaning as set forth in claim 16, wherein the plasma is generated with the substrate-supporting electrode at an output power of 100-200W.

18. A method of manufacturing a semiconductor device comprising:

carrying out a cleaning process according to any one of claims 1 to 17;

setting the substrate on the substrate-supporting electrode in the reaction chamber;

supplying a raw material gas into the reaction chamber;

and

generating a plasma to form a semiconductor film on the substrate.

19. The process of cleaning as set forth in claim 1, wherein the positioning of the insulating cover in tight contact with the substrate-supporting electrode comprises placing the insulating cover on the substrate-supporting electrode, and clamping the insulating cover to the substrate-supporting electrode by a mechanical element.